

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-5, 7-11 and 26-34 are presently pending in this application, Claims 1, 4, 28, 29 and 34 having been amended by the present amendment.

In the outstanding Office Action, Claim 29 was rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1, 4, 28 and 30-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 07-032183 (hereinafter “JP ‘183”) in view of JP 07-171796 (hereinafter “JP ‘796”), Eichelberger (U.S. Patent 5,250,843), JP 04-157470 (hereinafter “JP ‘470”) and JP 03-268316 (hereinafter “JP ‘316”); Claims 2 and 3 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP ‘183 in view of JP ‘796, Eichelberger, JP ‘470, JP ‘316, and JP 03-050372 U (hereinafter “JP ‘372”); Claim 29 was rejected under 35 U.S.C. §103(a) as being unpatentable over JP ‘183 in view of JP ‘796, Eichelberger, JP ‘470, JP ‘316, and JP 07-290396 (hereinafter “JP ‘396”); and Claim 34 was rejected under 35 U.S.C. §103(a) as being unpatentable over JP ‘183 in view of JP ‘796, Eichelberger, JP ‘470, JP ‘316, DiStefano et al. (U.S. Patent 5,640,761) or Berg (U.S. Patent 5,377,404). However, Claims 5 and 7-11 were indicated as allowed, and Applicant acknowledges the indication with appreciation.

Applicant also acknowledges with appreciation the courtesy of a personal interview granted to Applicants’ representative and assignee representative on July 24, 2007. During the interview, the outstanding issues were discussed and arguments in support of the patentability were presented. In particular, a cited reference, JP ‘316 (Yamashita), was discussed. Based on the discussions and the Examiner’s suggestions, Claim 4 has been amended to recite the step of “measuring the position of the at least one positioning mark through the at least one interlayer resin insulator with the camera by detecting light reflected

by the at least one positioning mark.” Also, Claims 28 and 34 depending from Claim 4 have been amended accordingly. Amended Claim 4 and its differences from the cited references are discussed below in more detail.

JP ‘316 (Yamashita) describes a method of aligning a mask with a substrate, as discussed during the interview. However, JP ‘316 does not teach “measuring the position of the at least one positioning mark covered by the at least one interlayer resin insulator with the camera by detecting light reflected by the at least one positioning mark” as recited in amended Claim 4. On the other hand, JP ‘316 discusses a method of aligning a mask with a silicon substrate having an alignment mark covered by a SiO₂ film,¹ not a resin insulator and a positioning mark formed over a multi-layer printed wiring board. Furthermore, the alignment mark is simply a projected portion of the silicon substrate² and according to JP ‘316, the alignment mark requires scanning the silicon substrate with laser light and detecting the intensity of the scattered light.. Therefore, the alignment mark is not read by a camera. For the foregoing reasons, the method of Claim 4 is believed to be clearly distinguishable from JP ‘316.

JP ‘796 (Otani) is related to a drilling method. Nevertheless, JP ‘796 is not believed to teach the measuring step recited in Claim 4. As discussed during the interview, JP ‘796 describes a method of drilling holes in a multilayer printed board, in which a test hole is bored based on an upper positioning mark in the multilayer printed board, and remaining pieces of a lower positioning mark exposed in the test hole are read by a camera. That is, instead of detecting the light reflected by the positioning mark through the interlayer resin insulator, JP ‘796 exposes remaining pieces of the lower positioning mark by the boring and calculates the mark position, which may compromise the positional accuracy. Also, since the

¹ See JP ‘316, Fig. 1(b).

² See id.

JP '796 method requires such a process of boring a test hole, this method is not believed to be applicable to methods such as those described in JP '470 and JP '316 which involve aligning a mask with a substrate, not drilling in a multilayer printed board. In particular, the drilling process to observe the exposed pieces of the mark and calculate the mark position as in JP '796 is not believed to be compatible with the JP '316 method which employs roughening the surface of the positioning mark to increase the intensity of the light scattered by the positioning mark. For the foregoing reasons, the method of Claim 4 is believed to be distinguishable from JP '183 and JP '796.

JP '470 is related to a circuit board exposure device and does not teach the measuring step as recited in amended Claim 4. On the other hand, JP '470 shows in Fig. 1 an exposure device which utilizes a substrate 2 having a *black* positioning mark 8 and a chuck 1 provided with a reflective member 11 positioned below the black positioning mark 8. When the substrate is illuminated, a contrast is produced because the light is reflected by *the reflective member 11*, not by the black positioning mark 8. Since JP '470 does not measure the position of the positioning mark 8 by detecting the light reflected by the positioning mark 8, the detection accuracy is believed to be relatively low. Therefore, the method as recited in Claim 4 is believed to be patentably distinguishable from JP '470.

Eichelberger, JP '372 and JP '183 are concerned with a die attach apparatus, a multilayer printed board and a drilling method, respectively. However, none of Eichelberger, JP '372 and JP '183 is believed to teach the measuring step as recited in amended Claim 4. Instead, Eichelberger simply discusses a die attach apparatus having an X-Y table 53 and an alignment microscope 62 used to determine the position of a reference mark, and JP '372 describes a multilayer printed board having a recognition mark 2, a reflective body 3 positioned underneath the recognition mark 2, and a transparent or semi-transparent insulation layer 4 provided between the recognition mark 2 and the reflective body 3.

However, since the recognition mark 2 and reflective body 3 are both made of light-reflective material and positioned to overlap each other, it is believed that the JP '372 method cannot measure the position of the recognition mark 2 by detecting the light reflected by the recognition mark 2 and seems to require, for example, illuminating only a portion of the reflection body 3. JP '183 discusses a simple drilling method which employs CO₂ laser and galvanomirrors. For the foregoing reasons, the method as recited in Claim 4 is believed to be distinguishable from Eichelberger, JP '372 and JP '183.

JP '396 is directed to a drilling method, and DiStefano et al. and Berg describe methods of manufacturing multilayer circuit boards. However, none of these references is believed to teach the measuring step as recited in Claim 4. Specifically, JP '396 describes a simple drilling method which illuminates the substrate with a fluorescent light, DiStefano et al. merely shows in Fig. 20 a circuit panel 544 which has guide marks 574 and 575 on the top and bottom surfaces of the panel, and Berg simply discusses a method of manufacturing a multi-layer printed circuit board in which a plurality of boards are laminated and then passed to a measuring station to locate hole positions by using a light source. Therefore, the method as recited in Claim 4 is believed to be distinguishable from JP '396, DiStefano et al. and Berg.

Because none of JP '316, JP '796, JP '470, Eichelberger, JP '372, JP '183, JP '396, DiStefano et al. and Berg discloses the measuring step as recited in Claim 4, even the combined teachings of these cited references are not believed to render the subject matter recited in Claim 4 obvious.

Turning now to Claim 1, Claim 1 recites "a camera configured to measure a position of the at least one positioning mark by detecting light reflected by the at least one positioning mark through the interlayer resin insulator." Therefore, for substantially the same reasons as set forth above for Claim 4, Claim 1 is believed to be distinguishable from the cited references as well.

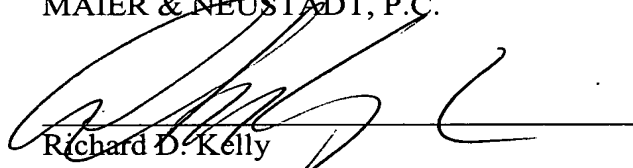
In response to the rejection under 35 U.S.C. §112, 2nd paragraph, Claim 29 has been amended for clarification and is thus believed to satisfy the requirements of the statute.

For the foregoing reasons, Claims 1 and 4 are believed to be allowable. Furthermore, since Claims 2, 3 and 28-34 depend either Claim 1 or 4, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2, 3 and 28-34 are also believed to be allowable.

In light of the prior indication of allowable claims and in view of the amendments presented above, no further issues are believed to be outstanding, and the present application is believed to be in condition for allowance. Therefore, Applicant respectfully requests an early and favorable action to that effect.

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